

South Florida Water Management District

Minutes of the
Scientific Peer Review and Public Workshop
Regarding the
Minimum Flows and Levels for Florida Bay

March 29 and 30, 2006
Key Largo, Florida

The published agenda for both meetings, all PowerPoint presentations by SFWMD staff, and other exchanges of written information may be viewed by clicking on the highlighted links.

**Minutes of the Public Workshop
March 29, 2006**

Attendees on March 29, 2006

SFWMD

Murray Miller
Scott Burns
John Mulliken
Dr. David Rudnick
Dr. Melody Hunt
Dr. Chris Madden
Amanda McDonald
Robin Bennett
Joel VanArman
Luna Phillips

Dr. Frank Marshall, consultant to the District

Expert Peer Review

Dr. Merryl Alber
Dr. Court Stevenson
Dr. Ken Heck

Public Participants

(Sign-Up Sheet)

Introduction

The meeting started at approximately 9:15am. John Mulliken, SFWMD Division Director, opened the meeting with an introduction of the individual peer review scientists and key SFWMD staff. The panelists include Dr. Merryl Alber (University of Georgia), Dr. Ken Heck (University of Alabama), and Dr. Court Stevenson (University of Maryland). Mr. Mulliken explained that the SFWMD has undertaken a study to identify the level of salinity that becomes a problem for Florida Bay and the species/location of seagrass that indicates when this level of salinity occurs. The purpose of the independent review is to determine if the study is based on reasonable scientific judgment. This workshop provides an opportunity for concerned citizens to hear the panel's questions of staff, as well as for the panel to hear the public's comments. The panel will issue a final report which contains recommendations based on their professional judgment. The panel's report will be the basis for the SFWMD's proposed minimum flow rule, scheduled for later this year.

Scott Burns, SFWMD Director of Water Supply Policy Implementation, provided a general perspective on minimum flows and levels (MFL) including a discussion on the various levels of harm recognized in the District's water use program. Mr. Burns also explained to the Panel their responsibilities with respect to the recommendations and conclusions to be contained in the expert report.

Joel VanArman, SFWMD Chief Scientist, explained the process and schedule for adoption of an MFL rule for Florida Bay.

A question was raised by a member of the audience regarding when additional MFLs will be developed for other parts of Florida Bay, particularly the Shark River Slough. Mr. VanArman replied that no timeframe has been set.

Technical Summary

Dr. Melody Hunt, SFWMD environmental scientist, presented an overview of the SFWMD's approach to analyzing flows of freshwater into the Taylor River and the relationship between freshwater flow and salinity.

Dr. David Rudnick, SFWMD Environmental Scientist, discussed the ecological effects of salinity in the Taylor River and Florida Bay.

Peer Panel Comments

Following staff's presentations, the panel was given the opportunity to present and discuss their review comments. Dr. Alber submitted preliminary written comments to SFWMD staff before the date of the workshop. Dr. Stevenson, panel chairman, began the discussion by indicating that the panel's comments will fall into four major subheadings:

- Project scope
- Water budget

- Submerged aquatic vegetation
- Higher trophic levels

Panel Questions and Staff Response

Dr. Stevenson asked why a transect west of Joe Bay was chosen to represent flows to northeastern Florida Bay. Dr. Rudnick began his response with an overview of the sources of freshwater flow to Florida Bay. Within northeastern Florida Bay, he indicated that there are significant data gaps on transects further east and that the Taylor River transect data was the most complete and comprehensive for the purpose of establishing the necessary relationships. Also, the west to east distribution has increased from the 1970s, to an approximately equal split. The flow from the Taylor River is critical to preventing hypersalinity in bays to the west.

Dr. Alber questioned whether the Taylor River transect is representative and if an MFL will rob water from other parts of the system. Dr. Hunt replied that salinity in Joe Bay responds similarly to Little Madeira Bay in the Taylor River transect. Dr. Rudnick pointed out that the diffuse direction of flow from Taylor Slough will protect Joe Bay.

Dr. Stevenson questioned whether groundwater wells existed in the region of Taylor River and whether a piezometric surface can be determined. Dr. Hunt responded that this would be difficult and deferred to the consultant (Dr. Marshall).

Dr. Stevenson asked if a water budget for the pre-managed system is available. Joel VanArman replied that a Natural System Model exists through which water levels and stages have been reconstructed, but that this model has large uncertainties in coastal areas such as the Taylor River.

Dr. Stevenson asked the panel if their questions regarding “project scope” had been covered and each responded to the affirmative. He then began questions under the topic of “water budget”. His first question was the degree of certainty regarding the evapotranspiration (ET) algorithm, followed by a comment on the lack of consideration for groundwater effects.

Dr. Alber asked what rainfall and ET assumptions were used in the MFL Base Case. She proceeded to clarify that the ET assumption in the sensitivity analysis appeared to be Dalton’s Law. Dr. Hunt explained that this information was in the appendices and would be clarified.

Dr. Rudnick indicated that a number of groundwater studies have been completed, resulting in a large range of estimates. Historical groundwater flow was significant perhaps, but his conclusion is that there is no indication of groundwater flowing into the Bay under current low flow conditions and,

therefore, the freshwater budget is based on surface water flows. Dr. Stevenson responded that groundwater flushes sulfides and provides a margin for error in protecting submerged aquatic vegetation. Dr. Hunt suggested that groundwater levels in some existing stations in the upstream wetland such as Craighead Pond could be further considered. Dr. Stevenson concurred by stating that a relationship between telemetric well data at Craighead Pond and surface water flow further down the Taylor River transect might be useful.

Dr. Alber indicated that the document was confusing regarding the water budget. Dr. Hunt agreed in that many different methods were considered and that this will be clarified. The MFL base case is an input to the FATHOM model which could be summarized over any period such as 33 years or during 1996-2000. Dr. Alber suggested that the approximate 360 million-cubic-meters/year estimate is quite different. Dr. Hunt replied that the salinity estimates were based on a longer (better) period of record. Dr. Alber stated that the 67% correction may not hold up 30 years ago. Dr. Hunt replied that this is considered to be best available information for the entire period.

Dr. Alber questioned the relationship between the FATHOM model and the historical reconstruction of the Taylor Slough period of record. Dr. Hunt discussed analysis in which the outputs compared favorably.

Dr. Alber asked whether regression analysis was undertaken further down in the Bay. The consultant (Dr. Marshall) indicated that comparison of monthly data and daily data revealed high correspondence. The consultant indicated that this comparison will be provided.

Dr. Stevenson suggested that the panel move on to the biological realm. His first comment was that *Ruppia* exists in a wide range of conditions, including hypersalinity, and cannot generally be used as an indicator. His suggestion was to use productivity (vs. cover) as a measure (e.g. pan florescence). Dr. Rudnick agreed that productivity would be more sensitive, but biomass would be difficult to measure. If *Ruppia* could be used as an indicator, what would the panel recommend as a metric for monitoring?

Dr. Stevenson continued by asking if some other species could be used, perhaps algae or *Utricularia*. Dr. Hunt indicated that this would need to be explored in future work. Mr. VanArman pointed out that the long-term impacts are important in this process. Productivity is a measure of rapid change and the need is for more of a threshold response and long-term impact than transitory effect.

Dr. Alber noted that *Ruppia* cover in year 2000 was zero. Her question (to Audubon) was whether there was a corresponding decrease in associated bird populations. Dr. Rudnick responded that factors other than salinity may have been affecting low *Ruppia* cover at that time. Again, Dr. Alber asked if there was

a corresponding change in bird populations. Robin Bennett, SFWMD scientist, indicated that this data has been collected but not yet analyzed.

Dr. Hunt, with reference to hydrology, indicated that local rainfall conditions were different than regional conditions at that time. Mr. Mulliken explained how regional conditions could mask local conditions.

Dr. Stevenson noted the competition between *Thalassia* and *Halodule* in the seagrass model. Dr. Madden explained that there is no factor for differences in light and that phosphorus uptake is mass-balanced through the roots. Dr. Stevenson asked if there was *Ruppia* output. Dr. Madden indicated that there is currently no data, but that a consultant (Margarite Koch) is under contract to examine the comparative interaction between the three seagrass species.

Dr. Alber asked if monthly average salinity was used in FATHOM and Dr. Madden replied affirmatively. Dr. Alber asked how salinity would change using daily data. Amanda McDonald, SFWMD scientist, suggested that the monthly averaging tended to mask low salinity events, thus favoring *Thalassia*. Also, only monthly data is available in hindcasting salinity using FATHOM.

Dr. Alber referred to figures contrasting SAV response in Little Madeira and Eagle Bays. Her conclusion was that salinity is not the only factor driving SAV response and that nutrients seem to be having an effect. Dr. Madden responded that salinity does affect the competitive dynamics. Dr. Rudnick stated that the competition is keener in Little Madeira. Ms. McDonald stated that factors other than salinity are the same in these bays. Dr. Alber, for clarification, asked if this meant nutrient concentration in the root zone. Ms. McDonald clarified further that this was concentration, not distribution.

Dr. Stevenson asked why macro-algae were not considered in the SAV model. Dr. Madden responded that this was a function of time.

Dr. Heck noted that the plant/animal interaction in the upper trophic level modeling was “one-way”. The grazing effect of animals, such as manatees, on vegetation should be considered. He also cautioned on the use of changing baselines. He also suggested that fish harvesting and population rebound is occurring now, in contrast with the hindcasting approach used here. Dr. Madden acknowledged this and felt that such improvements would favor using *Ruppia* as an indicator.

Dr. Heck suggested that animals move back and forth between habitats, so surrounding habitats (e.g. mangroves) should be considered.

Dr. Heck summarized the dilemma inherent in the approach as one where the variation in animal response is not strong and salinity is a weak predictor. Ms. Bennett agreed. Dr. Heck pointed out that the animal collection occurred in

Thalassia, *Halodule*, and *Syringodium*, not *Ruppia*. Ms. Bennett indicated that some data had been collected. Dr. Madden questioned the panel as to whether research has been published which would allow an expansion of the seagrass model into landscape scale. Dr. Heck responded that this has been done for grey snapper. Ms. Bennett also confirmed this fact for Whitewater Bay.

This concluded the panel commentary and the workshop adjourned for lunch.

Public Comment

Following lunch the panel opened the workshop for public comment as follows:

Pauline Kline, Keys resident, noted that the flood pulse releases from the C-111 cause significant impacts in Barnes and Blackwater Sounds. More testing should be conducted further south. Dr. Rudnick indicated that the C-111 restoration and CSOP will address flood pulse releases explicitly. We still don't know what causes the algal blooms, currently occurring, in Blackwater Sound.

Robert Burt, Keys resident, noted poor water quality in Tarpon Basin since Hurricane Wilma and requested more monitoring.

Mary Kay Magrath, Keys resident, noted poor water quality in her canal since Hurricane Katrina, including excessive foam. She implicated pesticides in floodwater coming from Miami-Dade County.

Mr. Mulliken introduced Cecilia Weaver, Florida Keys Service Center Director. He indicated that Ms. Weaver was available as a contact for local residents to try to work with local entities and state agencies to better determine the sources of problems and to improve oversight and monitoring of ongoing projects. John Mulliken indicated that many of these problems were related to after-effects of last year's hurricane.

Peter Frezza, National Audubon Society, noted that hypersaline conditions occurred in 2000-2001 and 2004-2005, with complete die-off of SAV in the transition zone, and that both instances were minor, not severe, drought events. His question was whether the goal of the MFL was to reduce or eliminate hypersalinity or die-offs. Dr. Rudnick responded that the proposed salinity threshold was not to prevent hypersalinity, rather to protect resources in general from man-made impacts. The best approach for protecting these resources, given available time, data, and sensitivity, is the indicator and threshold we have described. Mr. VanArman clarified further by stating that regional return frequencies, historical or otherwise, are part of the discussion, but difficult to determine given the tools we now have. Mr. Mulliken added that our goal is not to drought-proof this system and pointed out that 2004 was an odd year with an exceptional dry season and four hurricanes. High salinities could be related to storm driven surges of bay water into the transition zone ponds. He questioned

whether the system has recovered yet. Mr. Frezza indicated that he is just now starting to see recovery. Dr. Hunt stated that Mr. Frezza's field data substantiates the SFWMD's work. Mr. Frezza agreed that *Ruppia* was a good indicator of salinity's effects.

Mr. Frezza continued by stating that salinity in 2001 was greater than 30psu, contrary to that shown by SFWMD's analysis. Dr. Rudnick felt that the District's failure to capture the high salinity conditions was a result of temporal and spatial extrapolation used to compensate for non-continuous monitoring.

Mr. Frezza questioned whether the MFL would be integrated into CSOP and Mod Waters projects. Mr. Mulliken explained the schedule for the development of MFL criteria and defined and explained the need for recovery or prevention plans to ensure that proposed MFL criteria would be met.

Mr. Frezza suggested that *Utricularia* would be a good indicator of SAV biomass when salinities are below 5psu.

Dr. Jerry Lorenz, Research Director for Audubon, responded to Dr. Alber's previous question regarding whether the proposed MFL could potentially rob water from other natural areas. He provided historical background on the diversion of water from Taylor Slough to the C-111 basin and changes in the relative distribution of flows between C-111 and Taylor Slough through time. In the 1980s, there was ten-times more water flowing through the C-111 Basin than flow through Taylor Slough. This was improved in the 1990s to roughly 2:1, still too much through the C-111. More flow is needed to Taylor Slough. He presented data from three sites and concluded that peak dry season salinities in January at Taylor Slough sites determines salinity levels in Florida Bay and that a minimum flow in Taylor Slough will increase productivity in the Bay. Dr. Lorenz's presentation is included here. Dr. Stevenson restated this by questioning whether the Taylor River is a good indicator for the Bay, and again, Dr. Lorenz affirmed his conclusion. Dr. Rudnick noted that the difference between Dr. Lorenz's data and the SFWMD analysis is the use of marsh stages and ungauged flow analysis, and this accounts for a slightly different ratio in distribution. Dr. Lorenz has salinity data available, collected since 1989.

Mr. Burns emphasized the statutory limitations on MFLs, versus the potential for restoration and the use of reservations. Mr. Mulliken affirmed that the SFWMD's intention is not to "manage the flow down" to a proposed MFL threshold.

H.T. Pontin, resident, complained that nothing but studies have been done to address higher Bay salinities and temperatures. The Boesch report (1993) identifies the problem caused by construction of the Flagler railway and causeways that restricted exchange between the Bay and the Atlantic Ocean. Nothing has been done to address this problem. Dr. Rudnick replied that research does suggest that Flagler's construction did, in fact, reduce ocean

exchange. Dr. Stevenson noted that sea level rise will improve the Bay's inflow of seawater.

Dr. William Perry, National Park Service scientist, continued this discussion by noting that the Bay is under stress resulting from the diversion of freshwater. A conservative MFL is necessary to avoid a catastrophic collapse. Past research by Fenema concludes that drought frequency has increased in comparison to historical (pre-C&SFP) conditions. Relatively speaking, now an average year is drier, hypersalinity occurs more often, and wading bird populations have not recovered.

Dr. Perry stated that the documentation is comprehensive, but with focus on one-species management. He suggested that more indicators of trophic interaction are needed. The upper trophic level analysis is weak; wading birds and forage fish should be considered. Additional information is being gathered. Dr. Perry advised that the Natural System Model (NSM) is not a good simulation tool in this region.

Dr. Perry asked if there is a proposed schedule for updating this MFL. Mr. Mulliken noted that the MFL can be revised and updated at any time. Mr. Burns noted that specific MFLs rules (in Ch.40E-2 FAC) can be used to specify an update schedule. Two existing MFLs specify a five-year timeframe for an update. He also suggested that the rule should be constructed to include specific data collection or research tasks that should be accomplished before the update. Mr. Mulliken pointed out that operational changes that were made 12 years ago were clearly a step in the right direction. The Everglades National Park staff indicated that written comments would be submitted.

At this juncture, the public comment period was closed. Luna Phillips, SFWMD Office of Counsel, summarized the requirements governing communication among panelists, as specified in Florida's Sunshine Law and Public Records Law. The panel had received previously an email summarizing these requirements. Ms. Phillip's presentation is provided on the website. The panel expressed a need to act collegially in the development of the panel's report. SFWMD staff and experts may post information on the District's website but were advised to not conduct in any discussion outside the requirements of the Sunshine Law. Mr. VanArman indicated that the SFWMD would explore developing an interactive web board, but at a minimum all communication and draft reports will be posted on the existing website. The ability to notice more meetings among the Peer Review panel was discussed as an option to facilitate the finalization of the expert report. Posting drafts on a website or web board is permissible but caution is advised where the discourse is controversial and occurs without the public's opportunity to participate.

Dr. Stevenson, as panel chairman, re-opened this public meeting for discussion of technical issues. He commented on his preference for Fig. 44, versus Fig. 46,

depicting seagrass model output. Dr. Alber reasserted the need to prove that the phenomenon is not the cyclic growth and die-back of *Ruppia* or caused by nutrients. Dr. Rudnick indicated that the observed SAV response is driven by nutrients, but that doesn't mean that it is not also driven by salinity.

Dr. Hunt asked if there were strategic priority to Dr. Alber's remaining water budget concerns. She offered to provide responses to Dr. Alber's water budget concerns within a week's time. Dr. Alber agreed to consider them within an additional week's time before formulating her final comments.

The consultant (Dr. Marshall) presented a comparison of regression model, data and FATHOM model outputs in several basins within the Bay. Also discussed the difference in using monthly grab sampling and daily data averaged to month for Whipray Basin. Dr. Marshall's presentation is available on the website. Dr. Rudnick noted that 2 different models, a regression in upper Taylor River pond and FATHOM in Little Madeira Bay and Eagle Key basin, were used to extrapolate salinities on the Taylor River transect. While Little Madeira shows good correlation, missed high salinities are a result of sampling frequency and there are months where high salinity periods occurred, but were missed in the sampling.

Dr. Hunt pointed to the fact that the ungauged flow split may be different. Dr. Alber agreed.

Dr. Stevenson asked if the real-time salinity measurement hits 30psu, could the SFWMD control room open gates. Mr. VanArman stated that this was the MFL's intended consequence. Dr. Rudnick discussed the fact that the *Ruppia* salinity relationship will lead to a practical target for water management operations. For example, a recent experiment was conducted in the 2005 dry season when inputs to Taylor Slough were ramped down gradually and, despite rainfall conditions, salinities in the transition zone were moderated. Mr. VanArman stated that this MFL will be applied in the context of adaptive management; if the salinity target is achieved and *Ruppia* doesn't respond in the predicted manner, additional analysis will be undertaken. Dr. Marshall discussed the range in confidence levels associated with salinity models in different basins in northeastern Florida Bay. The largest salinity error appears to be in the range of 8-10psu at the onset of the dry season in certain basins. He has applied his best professional judgment in the development and application of his salinity modeling. Dr. Rudnick indicated that the operations staff receives weekly reports on salinity at several sites on the transect. He stated that effective water management is possible based on the *Ruppia* salinity relationship and recent operational experience. Dr. Alber felt the document should more clearly state that salinity is directly related to impacts beyond the threshold, particularly since *Ruppia* tolerates high salinities. Dr. Rudnick commented on the difference between recent mesocosm work and *Ruppia*'s responses in the field. Dr. Stevenson also asked that temperature be ruled out as a factor. Dr. Madden

pointed out that when temperature drops, *Ruppia* declines here in southern Florida. Dr. Madden provided additional information about *Ruppia* and the seagrass model. This information includes seagrass model documentation, a report on the faunal effects of hypersalinity, and a report on the submerged aquatic vegetation effects of hypersalinity.

Dr. Stevenson asked if the Audubon data is available. Dr. Rudnick replied that it would be included in the next MFL update. Dr. Rudnick asked that the panel consider that this effort will be used in a public policy context, with a different standard than the typical “academic” or “publication” process. He encouraged the panel to apply its professional judgment in the use of “best available” information.

The meeting adjourned promptly at 5:00 pm and this concluded the public workshop meeting on the Florida Bay MFL.

**Minutes of the Peer Review Expert Panel Discussion
Executive Work Session
March 30, 2006**

Attendees on March 30, 2006

SFWMD

Murray Miller
Joel VanArman
Dr. David Rudnick
Dr. Chris Madden
Luna Phillips
Dr. Melody Hunt
Amanda McDonald

Dr. Frank Marshall, consultant for SFWMD

Expert Panel

Dr. Court Stevenson
Dr. Merryl Alber

The meeting on Thursday, March 30, 2006, started at approximately 9:00 am. On Thursday, March 30, 2006, the peer review panel convened in an executive work session at 9:00 am, as publicly noticed, for the purpose of determining the organization and scope of the panel’s report. Dr. Ken Heck was absent on this day. The two remaining panelists agreed that no further discussion on the organization of the report was necessary and each panelist could begin writing their respective contributions. Dr. Hunt and Dr. Marshall addressed Dr. Alber’s unresolved questions concerning the water budget analysis. Discussion ensued regarding the differences between various scenarios described in the

appendices. Staff agreed to re-write the document to clarify the main body of the report, particularly where the hydrologic analysis affects the ecological conclusions. The issues which require further follow-up are summarized in a response to Dr. Alber. In addition, the panelists agreed that the seagrass model could be better described in Chapter 4 and results emphasized. The panel determined that the list of general questions identified in the Statement of Work would be used as a guideline, i.e., not requiring specific response. Dr. Stevenson felt that a method for cross-referencing the questions to the panel's responses in the report would be developed. Alternatives to the panel's desire for further discussion among themselves in the development of their report under the Sunshine requirements were discussed. No additional resolution or guidance was provided by staff other than the use of publicly noticed meetings. In the absence of guidance, Mr. VanArman suggested that every document exchanged among panel members be copied to the project manager, who will then post them on the website.

The Expert Panel Discussion ended at approximately 11:00 am.